

Subsurface Geologic Mapping of the Columbia Basin Groundwater Management Area: Results and Applications

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Introduction

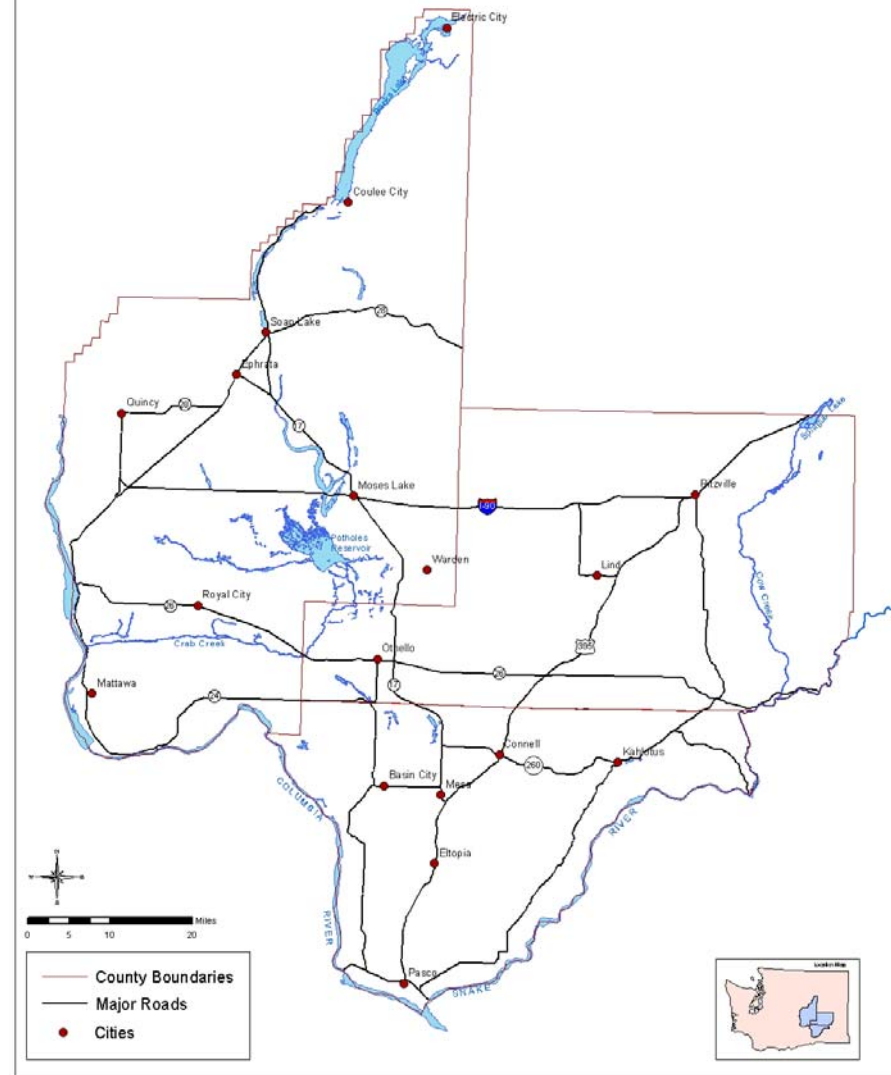
- **Project – Geologic delineation, nitrate-N**
- **Presentation – Mapping results, aquifer continuity and aquifer hydraulic connection**
- **Acknowledgements – FCD, GWMA, EPA, 25+ years of other work**

Location

- 3 Counties, east-central Washington
- 6000 square miles
- Groundwater, primary water source

GWMA Location Map

Figure 1

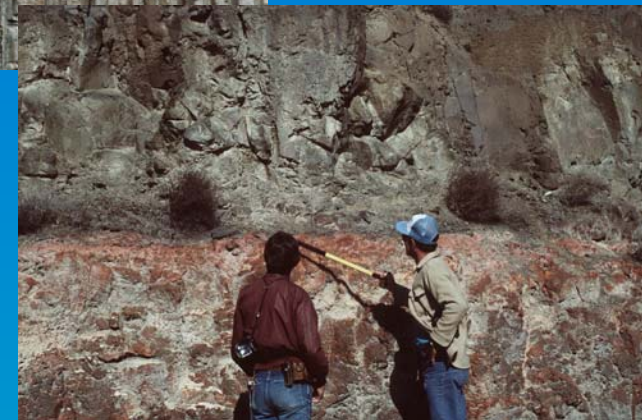
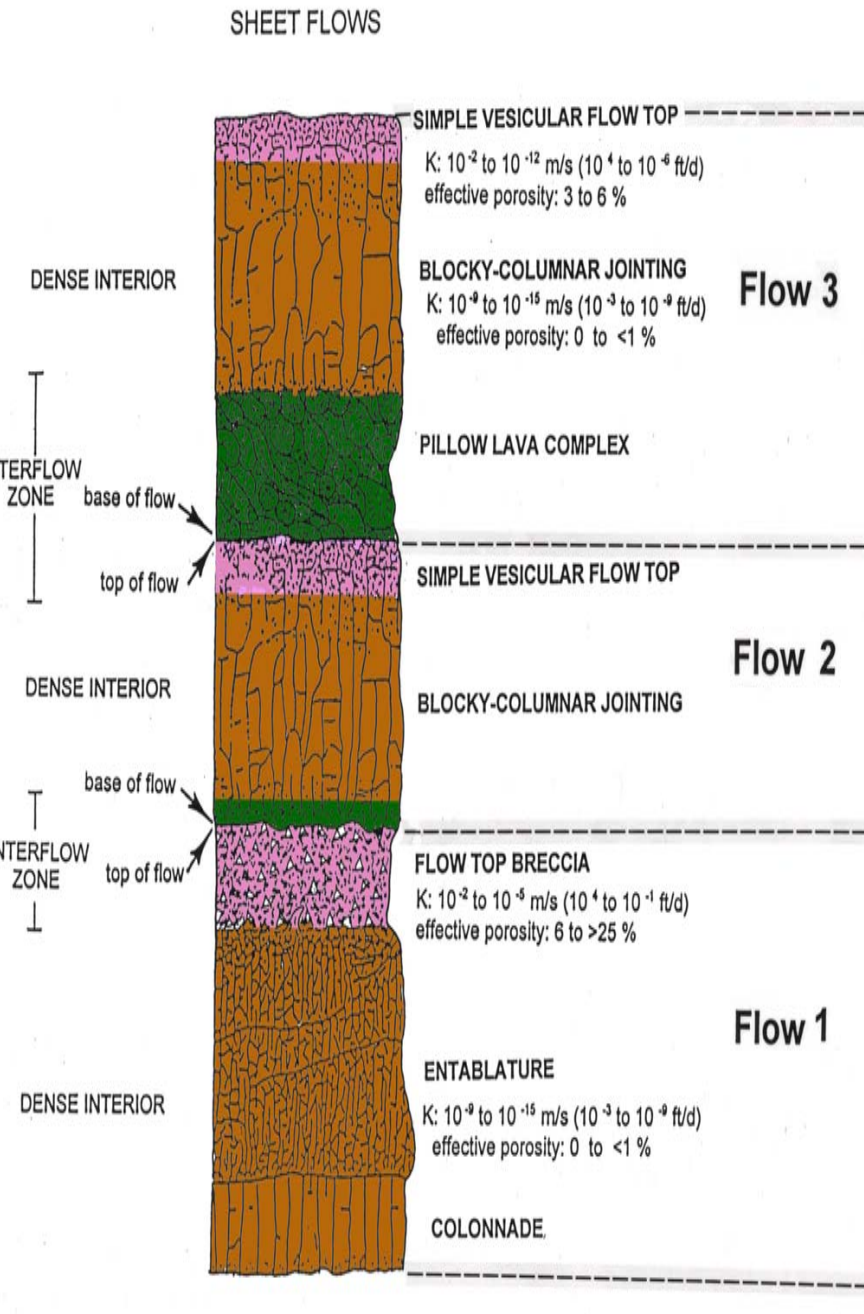


Background - Stratigraphy

- Quaternary Sediments
- Ringold Formation
- CRBG
 - Saddle Mountains Basalt (6 mbrs)
 - Wanapum Basalt (3 mbrs)
 - Grande Ronde Basalt (1 mbr)

					ISOTOPIC AGE (Ma)	MAGNETIC POLARITY	
SERIES	Group	FORMATION	MEMBER				
MIOCENE	UPPER	SADDLE MOUNTAIN BASALT	LOWER MONUMENTAL MEMBER		6	N	
			Erosional Unconformity				
			ICE HARBOR MEMBER		8.5		
			Basalt of Goose Island			N	
			Basalt of Martindale			R	
			Basalt of Basin City			N	
			Erosional Unconformity				
			BUFORD MEMBER			R	
			ELEPHANT MOUNTAIN MEMBER		10.5	R.T	
			Erosional Unconformity				
	POMONA MEMBER			12	R		
	Erosional Unconformity						
	ESQUATZEL MEMBER				N		
	Erosional Unconformity						
	WEISSENFELS RIDGE MEMBER						
	Basalt of Slippery Creek				N		
	Basalt of Tenmile Creek				N		
	Basalt of Lewiston Orchards				N		
	Basalt of Cloverland				N		
	ASOTIN MEMBER			13			
	Basalt of Huntzinger				N		
	WILBUR CREEK MEMBER						
	Basalt of Lapwai				N		
	Basalt of Wahluke				N		
	Local Erosional Unconformity						
	UMATILLA MEMBER			13.5			
	Basalt of Sillusi				N		
	Basalt of Umatilla				N		
	Local Erosional Unconformity						
	MIDDLE		Columbia River Basalt Group	WANAPUM BASALT	PRIEST RAPIDS MEMBER		14.5
		Basalt of Lolo					R
		Basalt of Rosalia					R
		Local Erosional Unconformity					
		ROZA MEMBER					T.R
		SHUMAKER CREEK MEMBER					N
		FRENCHMAN SPRINGS MEMBER					
		Basalt of Lyons Ferry					N
		Basalt of Sentinel Gap					N
		Basalt of Sand Hollow				15.3	N
		Basalt of Silver Falls					N.E
		Basalt of Ginkgo					E
		Basalt of Palouse Falls					E
		ECKLER MOUNTAIN MEMBER					
		Basalt of Dodge					N
		Basalt of Robinette Mountain				N	
		Local Erosional Unconformity					
		GRANDE RONDE BASALT		SENTINEL BLUFFS MEMBER		15.6	
				SLACK CANYON MEMBER			
				FIELD SPRINGS MEMBER			
	WINTER WATER MEMBER					N ₂	
	UMTANUM MEMBER						
	ORTLEY MEMBER						
	ARMSTRONG CANYON MEMBER						
	MEYER RIDGE MEMBER						
GROUSE CREEK MEMBER					R ₂		
WAPSHILLA RIDGE MEMBER							
MOUNT HORRIBLE MEMBER							
CHINA CREEK MEMBER					N ₁		
DOWNEY GULCH MEMBER							
CENTER CREEK MEMBER							
ROGERSBURG MEMBER				R ₁			
TEEPEE BUTTE MEMBER							
BUCKHORN SPRINGS MEMBER		16.5					
LOWER	IMNAHA BASALT			17.5			

Background- CRBG Hydrogeology



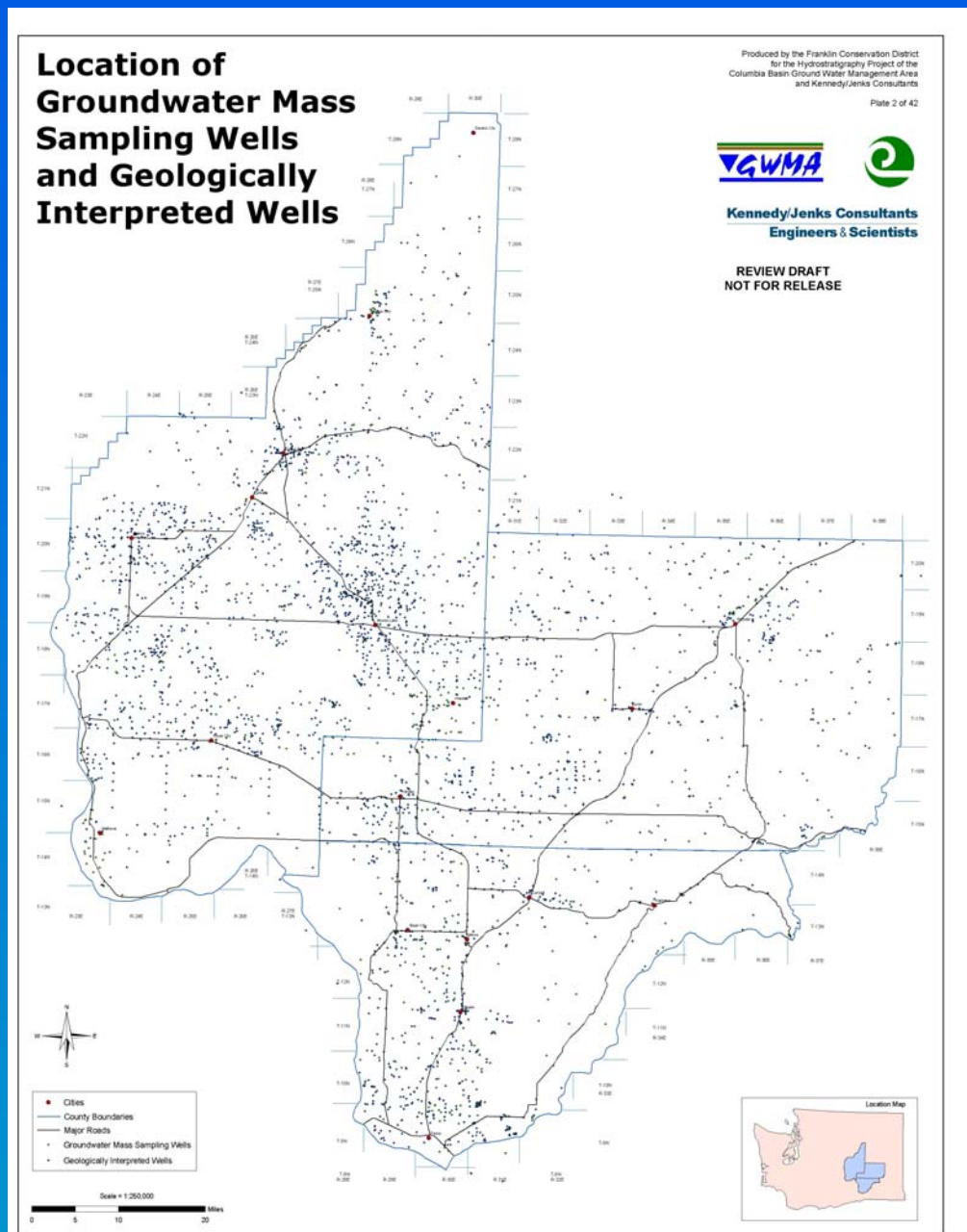
Background – Aquifer Discontinuities

- Basalt flow edges
- Coulees/erosion
- Wells
- Structures



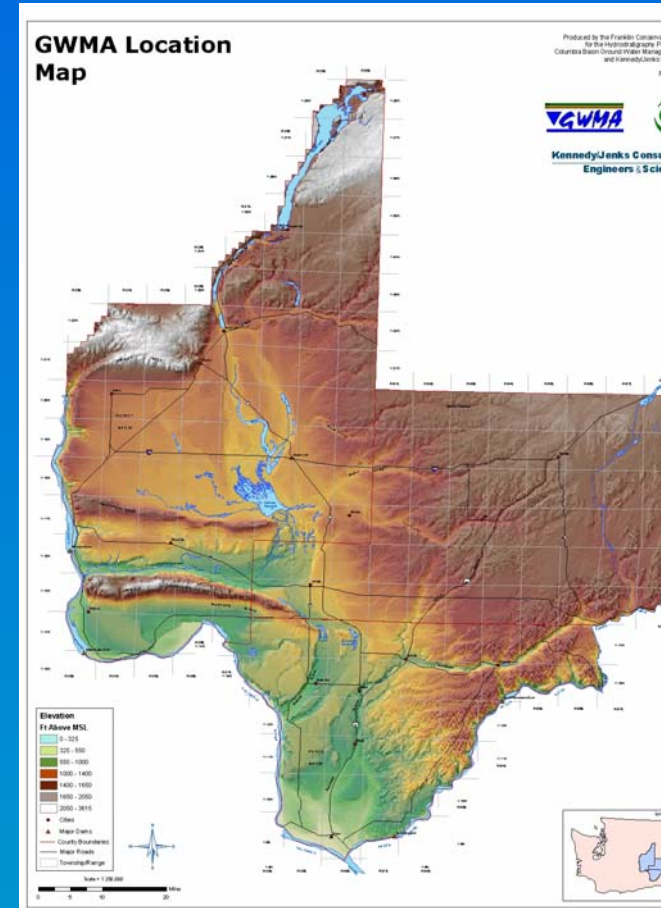
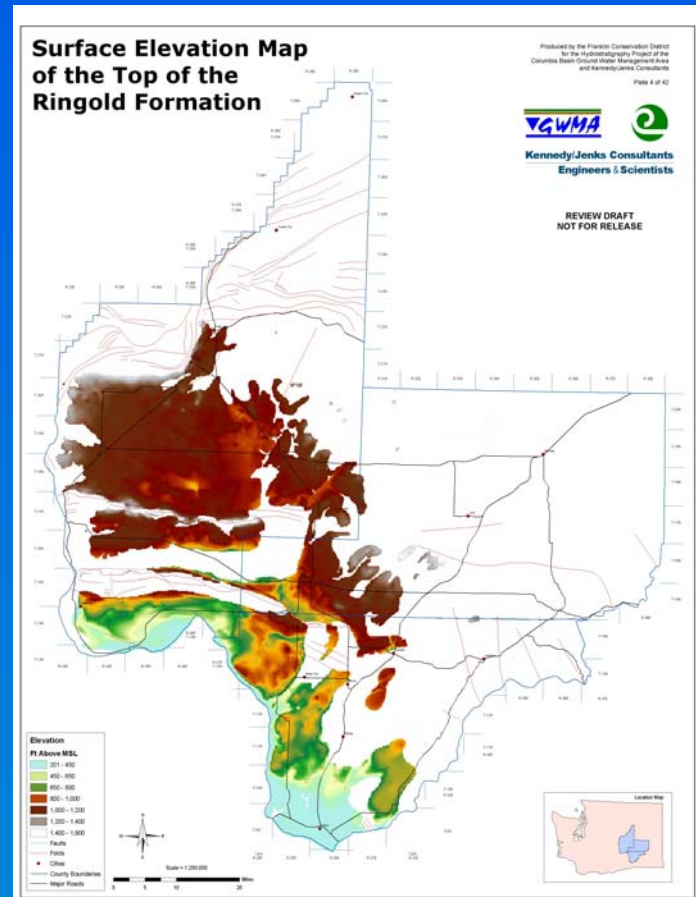
Mapping Data Base

- ~3000 of
>15,000 wells
- Personal files
(NC, SPR)
- Geochemistry
- Outcrops and
mapping



Results - Suprabasalt sediments

- Ringold - Basins
- Flood deposits - coulees



Results – Saddle Mountains Basalt

- Emplacement – smaller volume
- Erosion – more time
- Limited regional extent – vertical aquifer connections

Surface Elevation Map of the Top of the Pomona Member

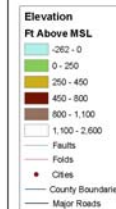
Produced by the Franklin Conservation District
for the Hydrostratigraphy Project of the
Columbia Basin Ground Water Management Area
and Kennedy/Jenks Consultants

Plate 16 of 42



Kennedy/Jenks Consultants
Engineers & Scientists

REVIEW DRAFT
NOT FOR RELEASE



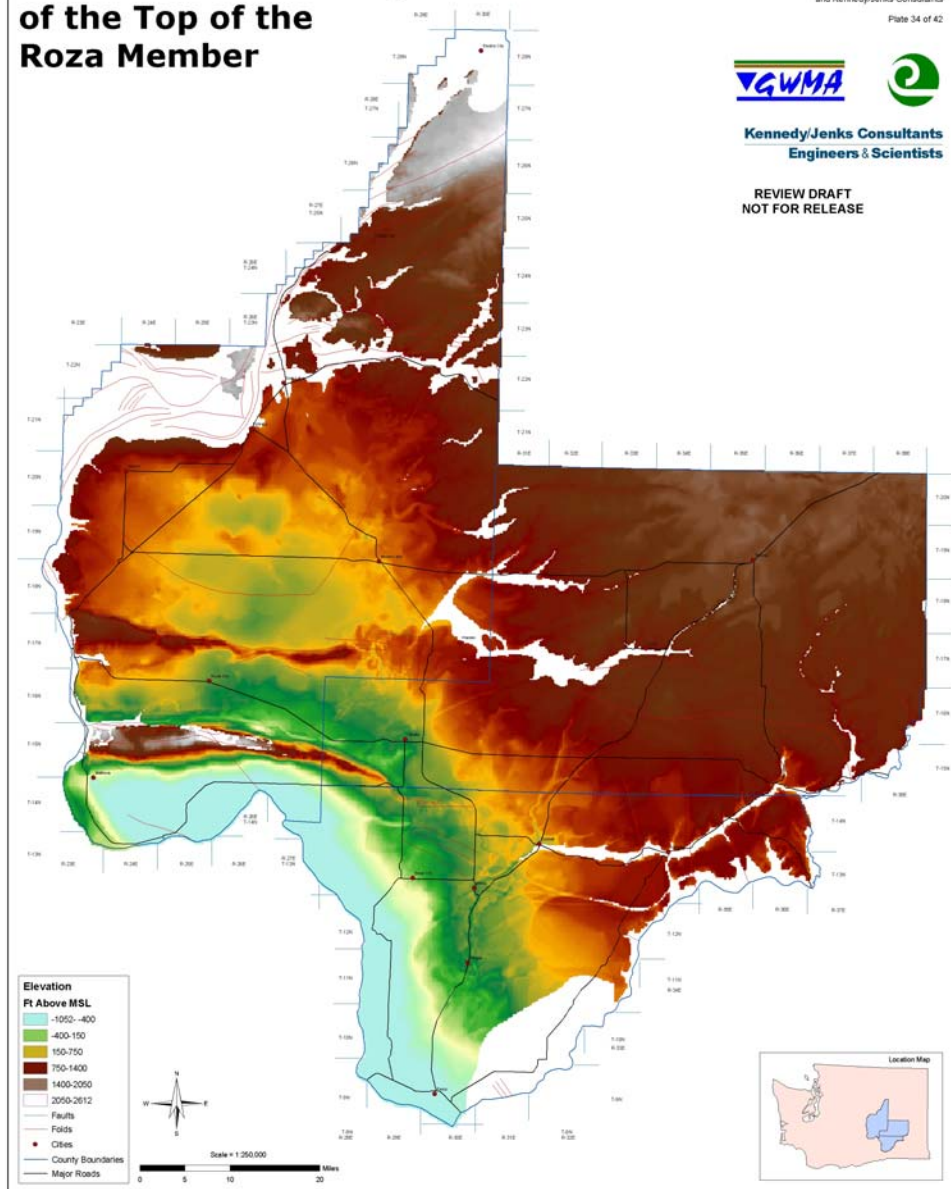
Scale = 1:250,000
0 5 10 20 Miles



Results – Wanapum Basalt

- More widespread
- Emplacement – structure (continues post emplacement) – subdivides aquifers
- Erosion – coulee, Ringold, and SMB incision – vertical aquifer connections

Surface Elevation Map of the Top of the Roza Member



Results – Grande Ronde Basalt



- Regionally widespread
- Emplacement – structure (continues post emplacement) – subdivides aquifers
- Erosion – limited, deepest coulees and canyons

Summary

- Major aquifer host rocks mapped
- Identify aquifer lateral continuity, aquifer vertical connections
 - Sediment – basins coulees
 - SMB – erosion
 - WB – erosion and structures
 - GRB - structures

